



勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-34970699  
 勝特力电子(深圳) 86-755-83298787  
 Http://www.100y.com.tw

# STB155N3LH6 STD155N3LH6

N-channel 30 V, 2.4 mΩ, 80 A, D<sup>2</sup>PAK, DPAK  
STripFET™VI DeepGATE™ Power MOSFET

## Features

Order codes	V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub> <sup>(1)</sup>	P <sub>TOT</sub>
STB155N3LH6	30 V	3.0 mΩ	80 A	110 W
STD155N3LH6				

- Current limited by package
- 100% avalanche tested
  - Logic level drive

## Applications

- Switching applications
- Automotive

## Description

These devices are N-channel Power MOSFETs developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFETs exhibits the lowest R<sub>DS(on)</sub> in all packages.

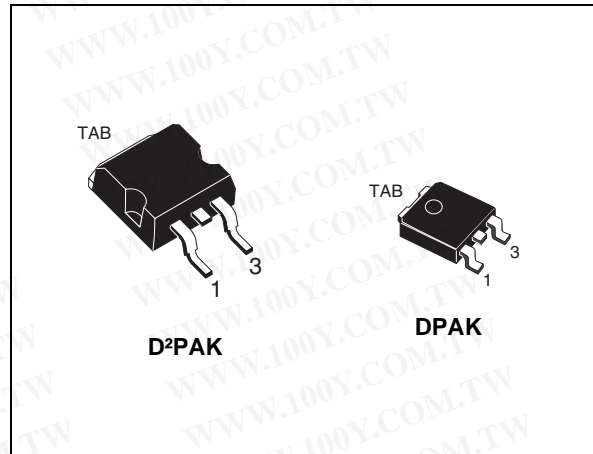


Figure 1. Internal schematic diagram

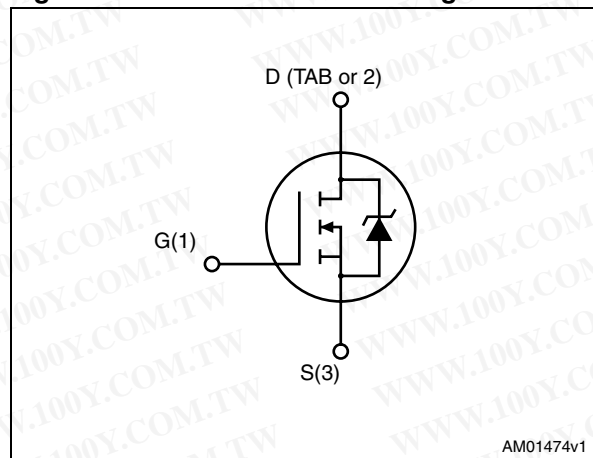


Table 1. Device summary

Order codes	Marking	Package	Packaging
STB155N3LH6	155N3LH6	D <sup>2</sup> PAK	Tape and reel
STD155N3LH6		DPAK	

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	30	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	80	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		$^\circ\text{C}$

- Limited by wire bonding.
- Pulse width limited by safe operating area.

**Table 3. Thermal resistance**

Symbol	Parameter	Value		Unit
		D <sup>2</sup> PAK	PAK	
$R_{thj-case}$	Thermal resistance junction-case max	1.36		$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	50	$^\circ\text{C}/\text{W}$

- When mounted on 1 inch<sup>2</sup> OZ Cu board.

**Table 4. Thermal resistance**

Symbol	Parameter	Value	Unit
$I_{AV}$	Not-repetitive avalanche current	40	A
$E_{AS}^{(1)}$	Single pulse avalanche energy	525	mJ

- Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = 40\text{ A}$ ,  $V_{DD} = 25\text{ V}$

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  unless otherwise specified).

**Table 5. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ( $V_{GS} = 0$ )	$I_D = 250\ \mu A$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 30\text{ V}$ $V_{DS} = 30\text{ V}, T_c = 125\text{ °C}$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}, I_D = 40\text{ A}$		2.4	3.0	m $\Omega$
		$V_{GS} = 5\text{ V}, I_D = 40\text{ A}$		3.2	4.0	m $\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$	-	3800	-	pF
$C_{oss}$	Output capacitance			725		pF
$C_{rss}$	Reverse transfer capacitance			420		pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}, I_D = 80\text{ A}$	-	80	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10\text{ V}$		15		nC
$Q_{gd}$	Gate-drain charge	(see Figure 14)		15		nC
$R_G$	Gate input resistance	f = 1 MHz gate bias Bias = 0 test signal level = 20 mV open drain	-	1.5	-	$\Omega$

Table 7. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 15\text{ V}$ , $I_D = 40\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 15)	-	15 85	-	ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 15\text{ V}$ , $I_D = 40\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 15)	-	100 40	-	ns ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		80 320	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 40\text{ A}$ , $V_{GS} = 0$	-		1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 80\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 24\text{ V}$ (see Figure 17)	-	35 26.5 1.7		ns nC A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%



## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

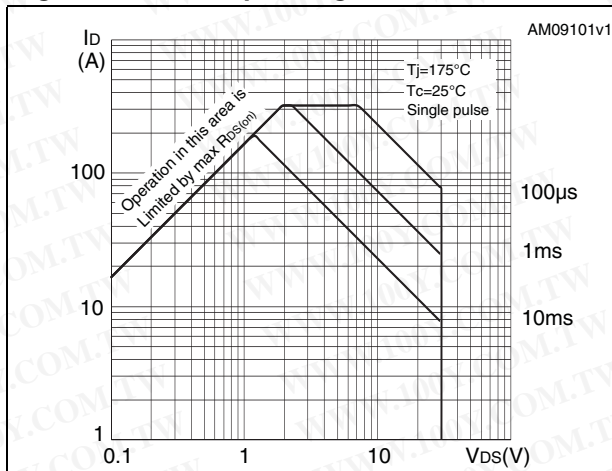


Figure 3. Thermal impedance

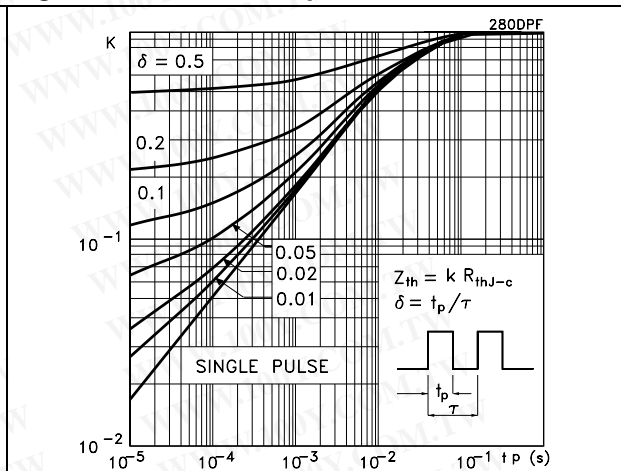


Figure 4. Output characteristics

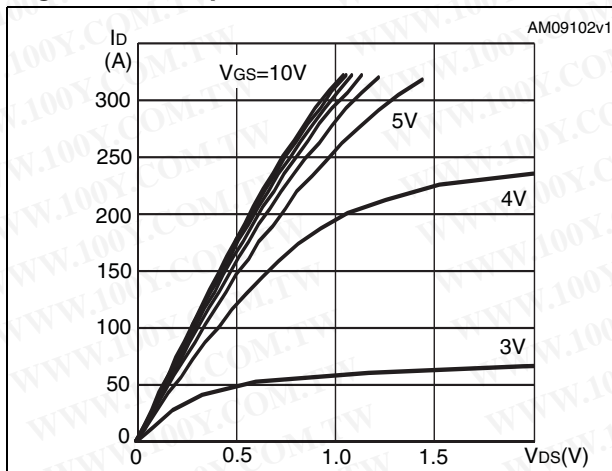


Figure 5. Transfer characteristics

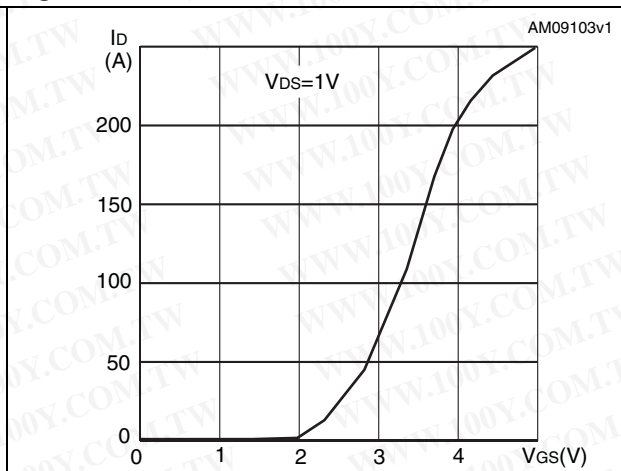


Figure 6. Normalized  $B_{V_{DS}}$  vs temperature

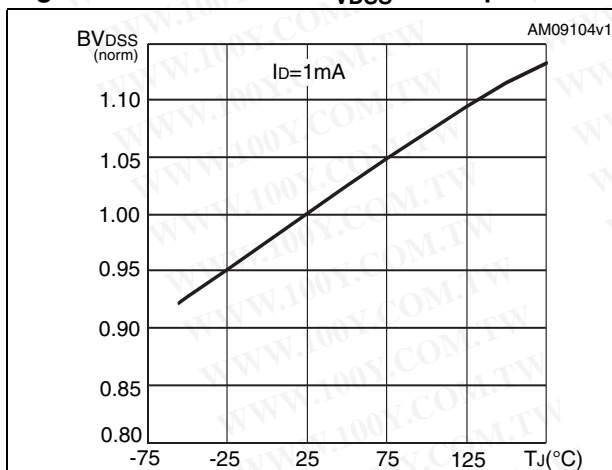


Figure 7. Static drain-source on resistance

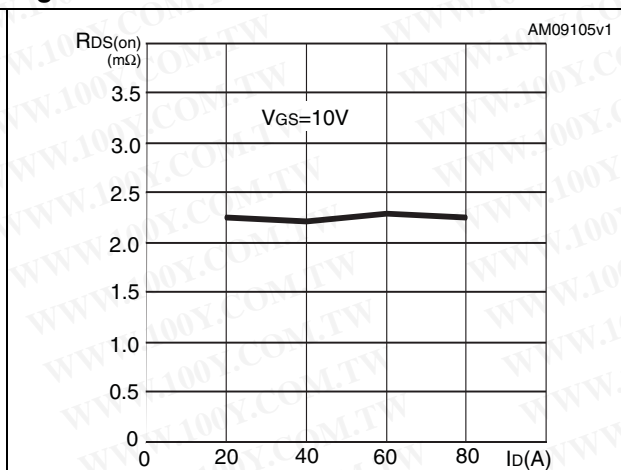


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

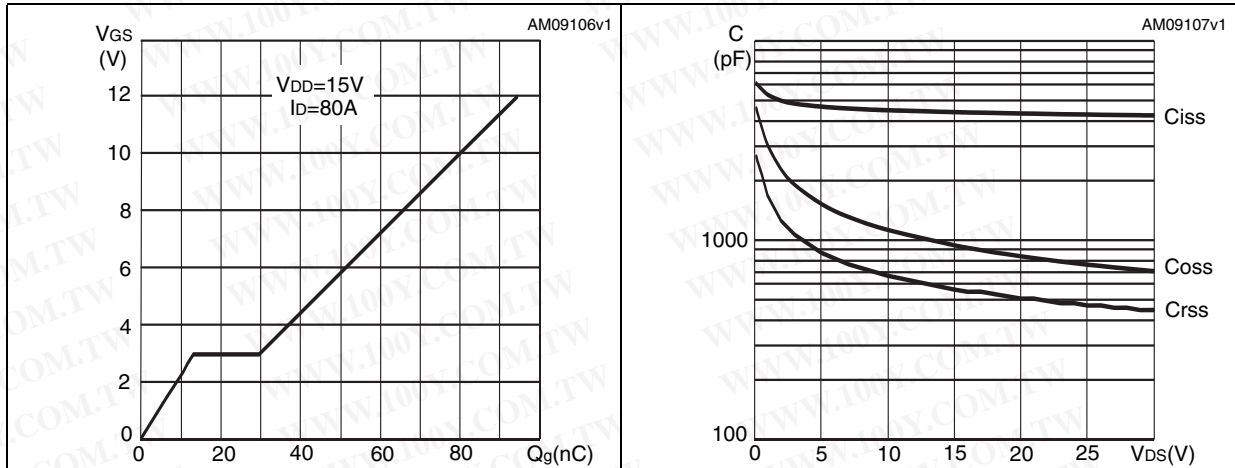


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

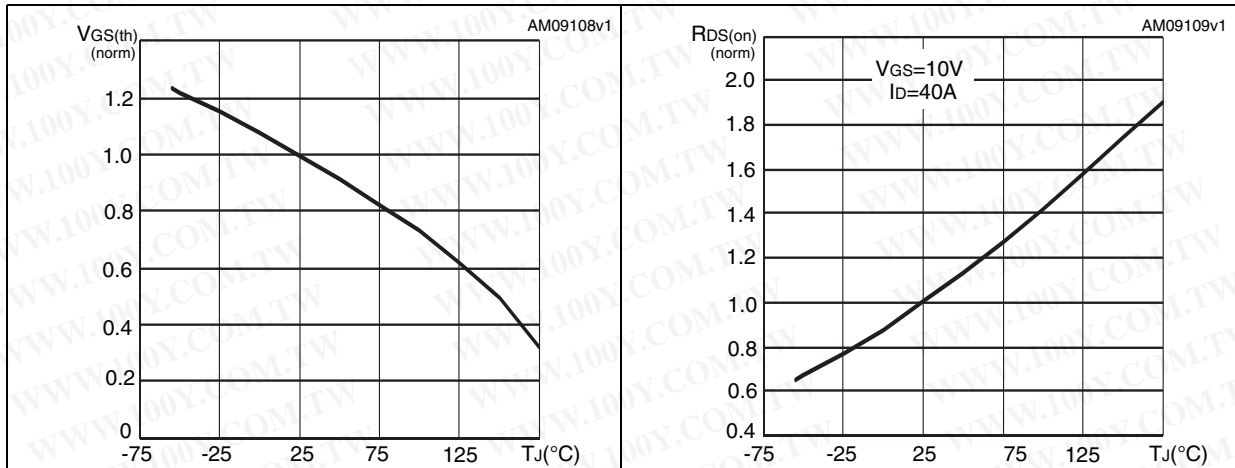
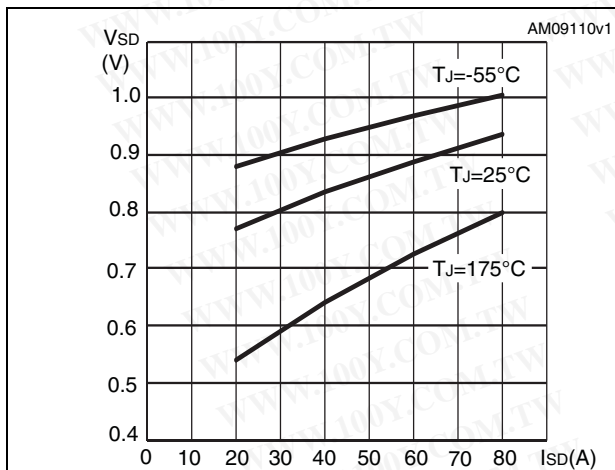


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

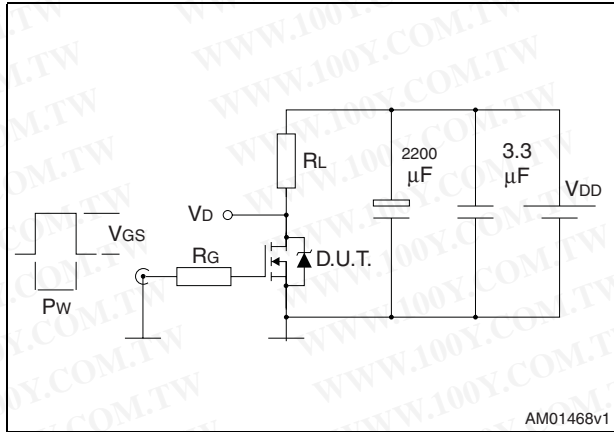


Figure 14. Gate charge test circuit

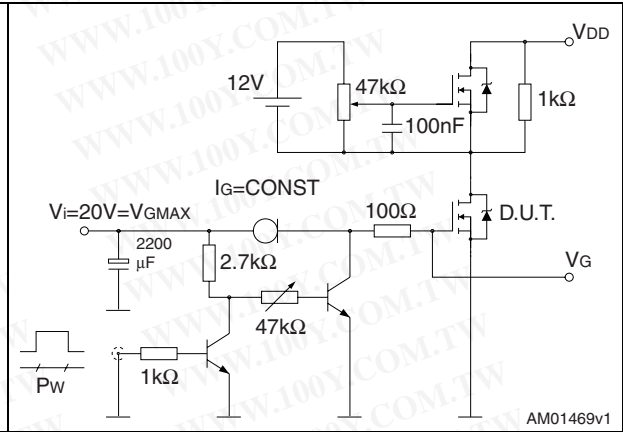


Figure 15. Test circuit for inductive load switching and diode recovery times

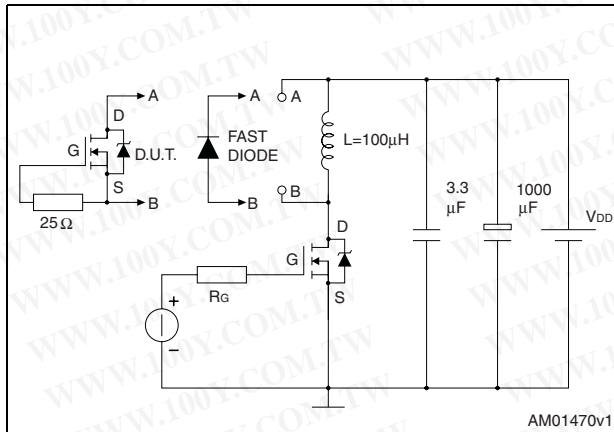


Figure 16. Unclamped Inductive load test circuit

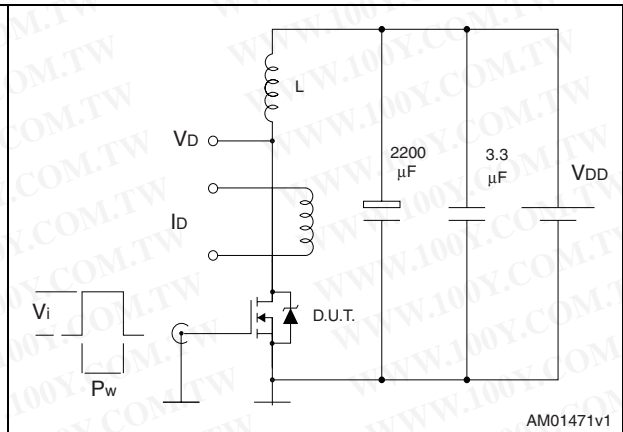


Figure 17. Unclamped inductive waveform

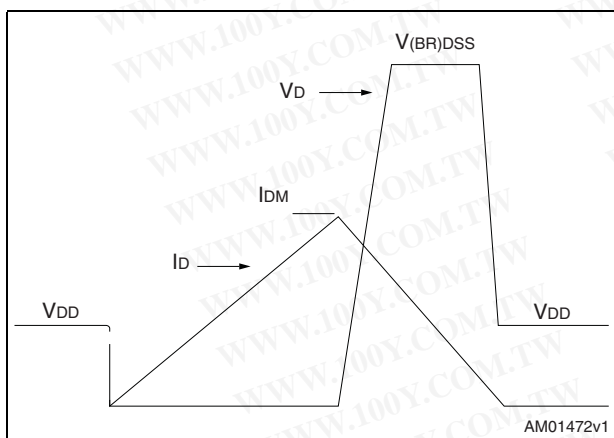
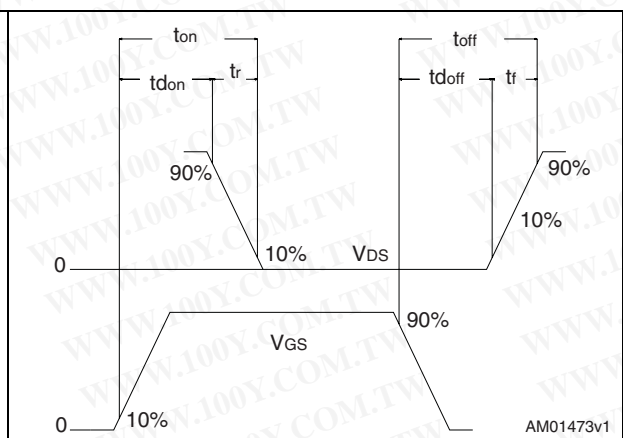


Figure 18. Switching time waveform





## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

Table 9. D<sup>2</sup>PAK (TO-263) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50		
E	10		10.40
E1	8.50		
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 19. D<sup>2</sup>PAK (TO-263) drawing

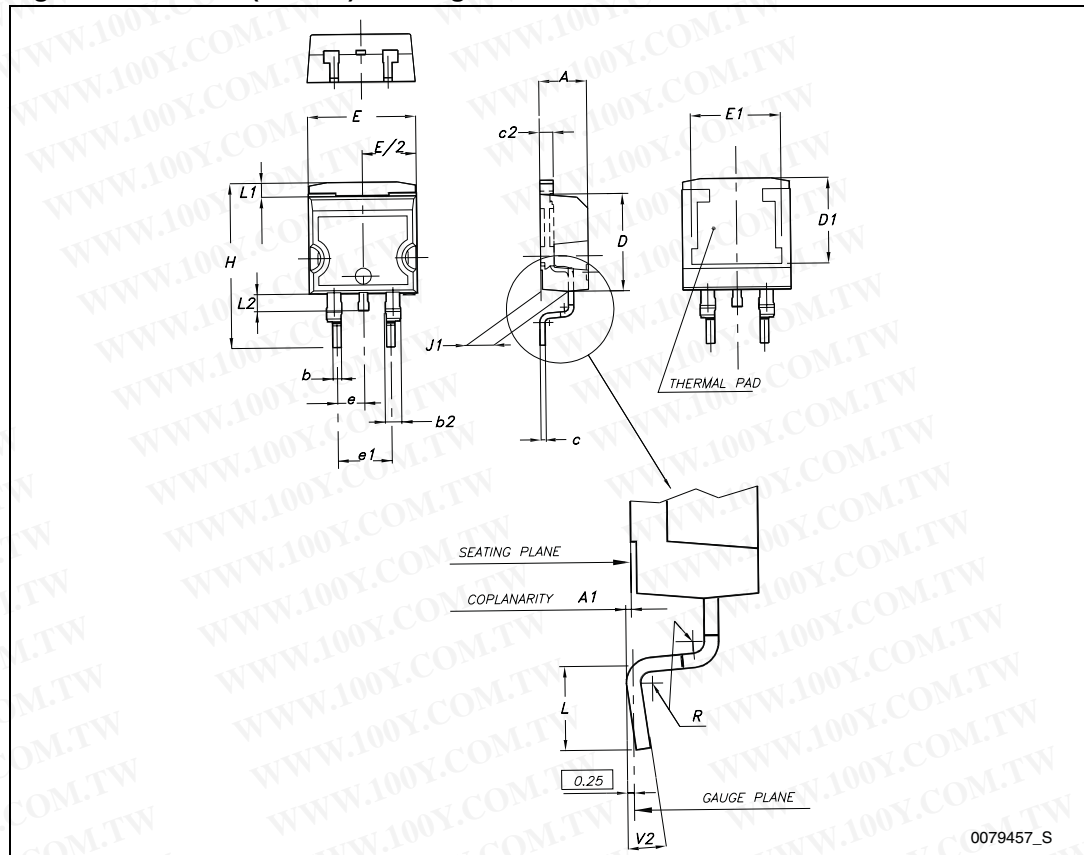
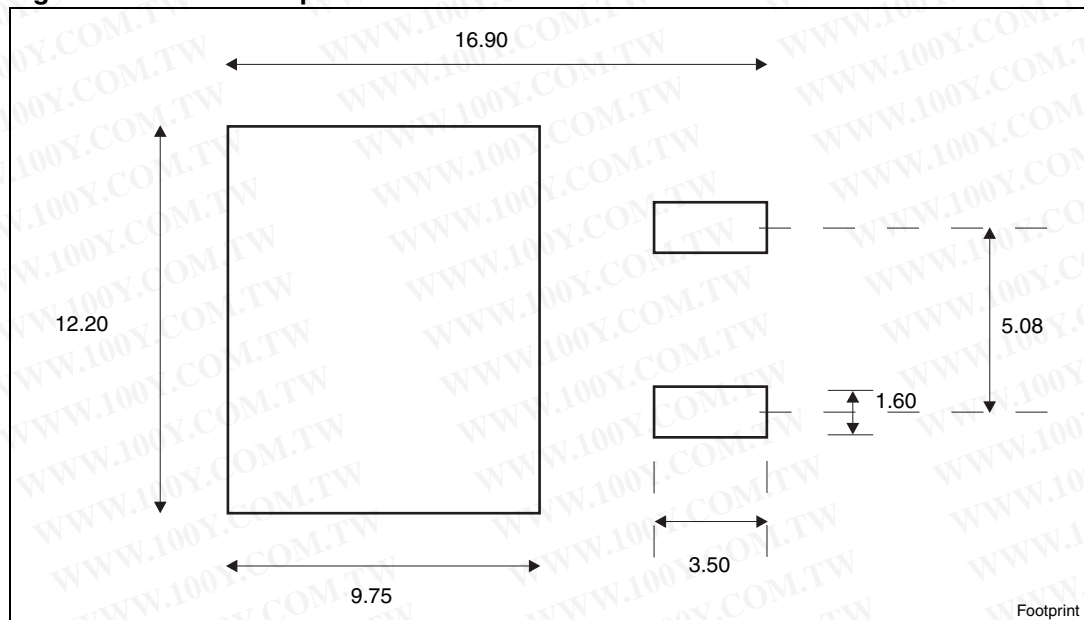


Figure 20. D<sup>2</sup>PAK footprint<sup>(a)</sup>



a. All dimension are in millimeters

Table 10. DPAK (TO-252) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		1.50
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 21. DPAK (TO-252) drawing

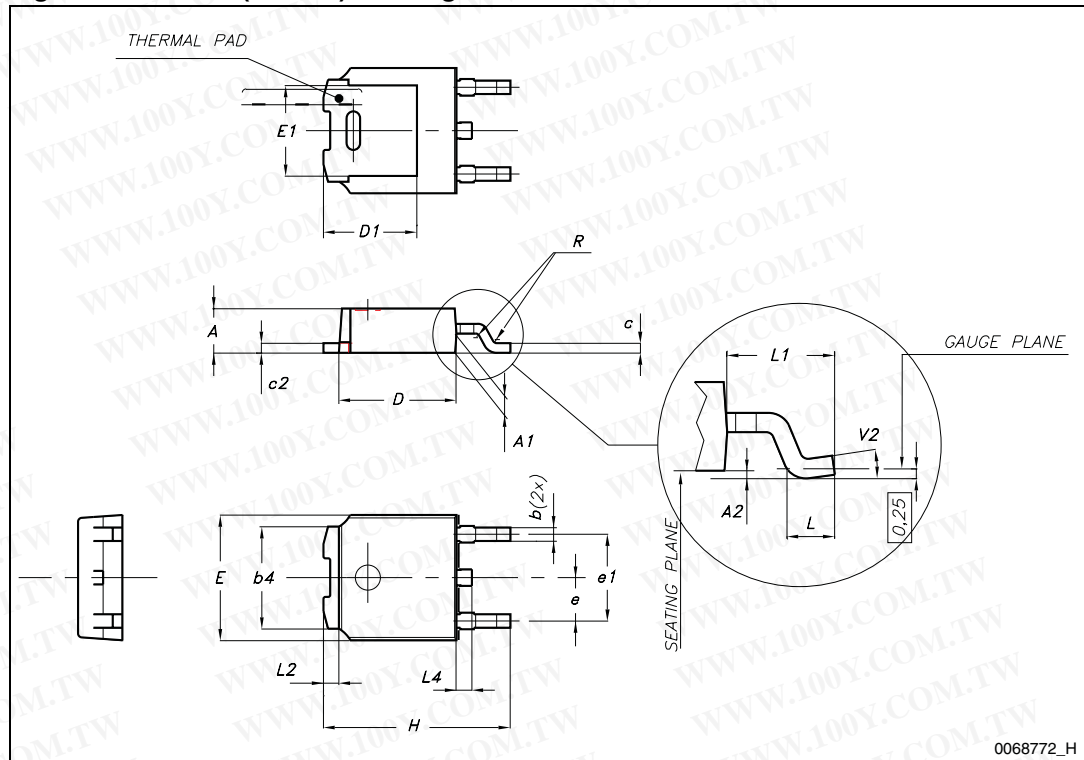
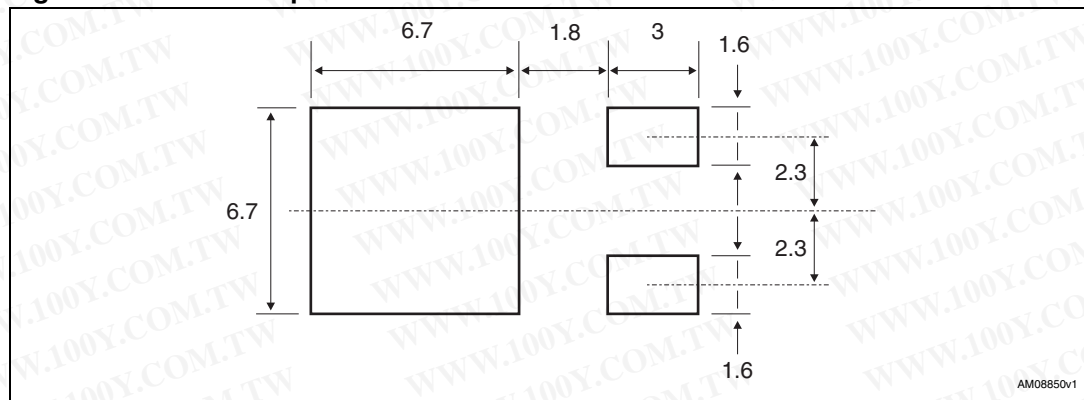


Figure 22. DPAK footprint<sup>(b)</sup>



b. All dimension are in millimeters



## 5 Packaging mechanical data

Table 11. D<sup>2</sup>PAK (TO-263) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1		Base qty	1000
P2	1.9	2.1		Bulk qty	1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Table 12. DPAK (TO-252) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1		Base qty.	2500
P1	7.9	8.1		Bulk qty.	2500

Table 12. DPAK (TO-252) tape and reel mechanical data (continued)

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Figure 23. Tape for D<sup>2</sup>PAK (TO-263) and DPAK (TO-252)

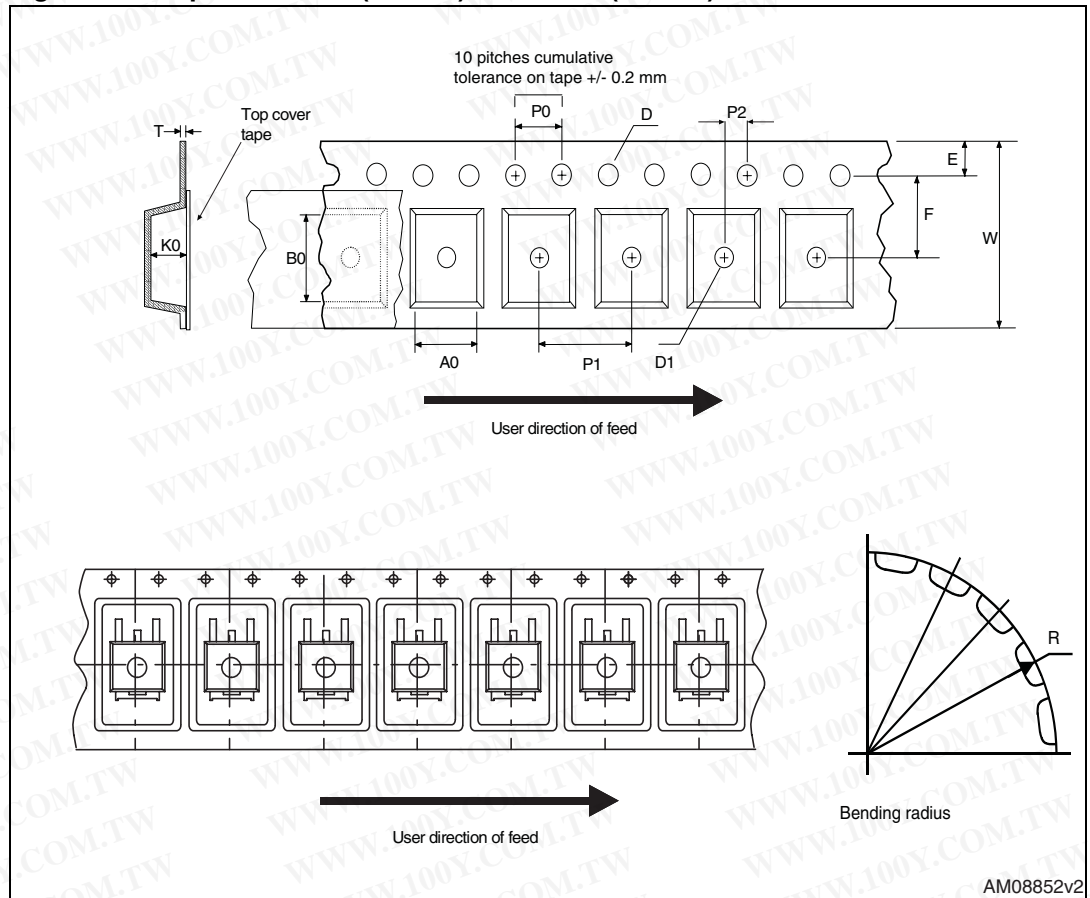
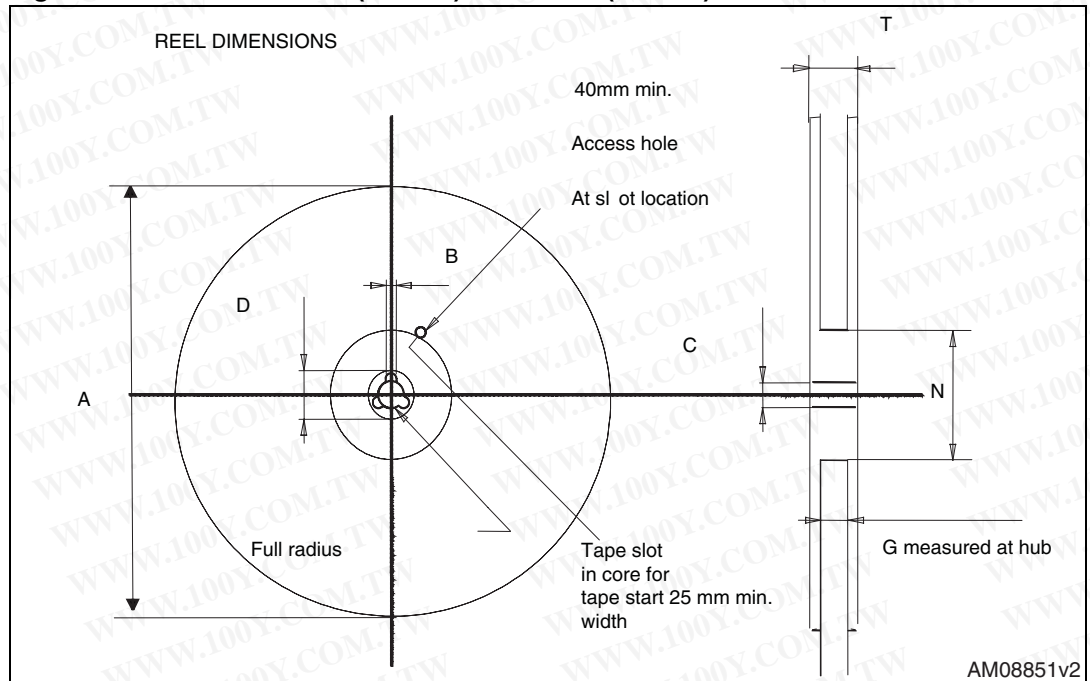


Figure 24. Reel for D<sup>2</sup>PAK (TO-263) and DPAK (TO-252)



## 6 Revision history

**Table 13. Document revision history**

Date	Revision	Changes
02-Sep-2010	1	First release.
12-Apr-2011	2	Document status promoted from preliminary data to datasheet.
27-Sep-2011	3	Updated <a href="#">Table 1: Device summary</a> , <a href="#">Figure 2: Safe operating area</a> and <a href="#">Section 4: Package mechanical data</a> . Minor text changes.

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